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(54) **FOLDING CONTAINER**

(75) Inventors: **Chien-Sung Deng**, Miao-Li (TW); **Hung-Wen Yang**, Miao-Li (TW)

(73) Assignee: **Innolux Display Corp.**, Miao-Li (TW)

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(51) **Int. Cl.**
B65D 85/48 (2006.01)

(52) **U.S. Cl.** **206/600**; 206/454; 220/6

(58) **Field of Classification Search** 220/4.28, 220/4.32, 4.33, 4.34, 6; 206/600, 454, 456
See application file for complete search history.

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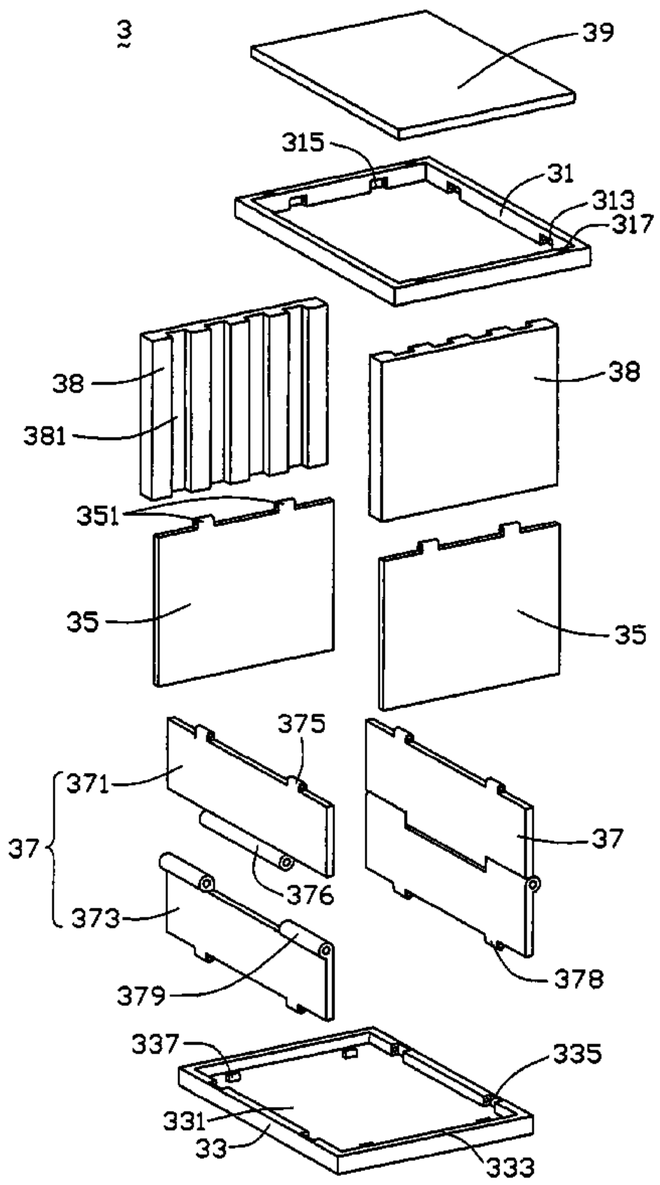
Primary Examiner—David T. Fidei
(74) *Attorney, Agent, or Firm*—Wei Te Chung

(57) **ABSTRACT**

A folding container (**3**) comprises: an upper frame (**31**) including a pair of first and second opposite sides; a pair of side plates (**35**) being pivotally connected to a respective first side and movable relative to the upper frame; a pair of folding plates (**37**) positioned between the side plates, each of the folding plates including an upper plate (**371**) and a lower plate (**373**), each of the upper plate being pivotally connected to a respective second side; a bottom plate (**33**) including a pair of second opposite sides corresponding to the second sides of the upper frame, each lower plate being pivotally connected to the bottom plate, the side plates and folding plates and bottom plate cooperatively forming a receptacle; and a pair of slot plates (**38**) with a plurality of slots (**381**), each of the slot plates being adjacent to a respective one of the side plates.

13 Claims, 5 Drawing Sheets



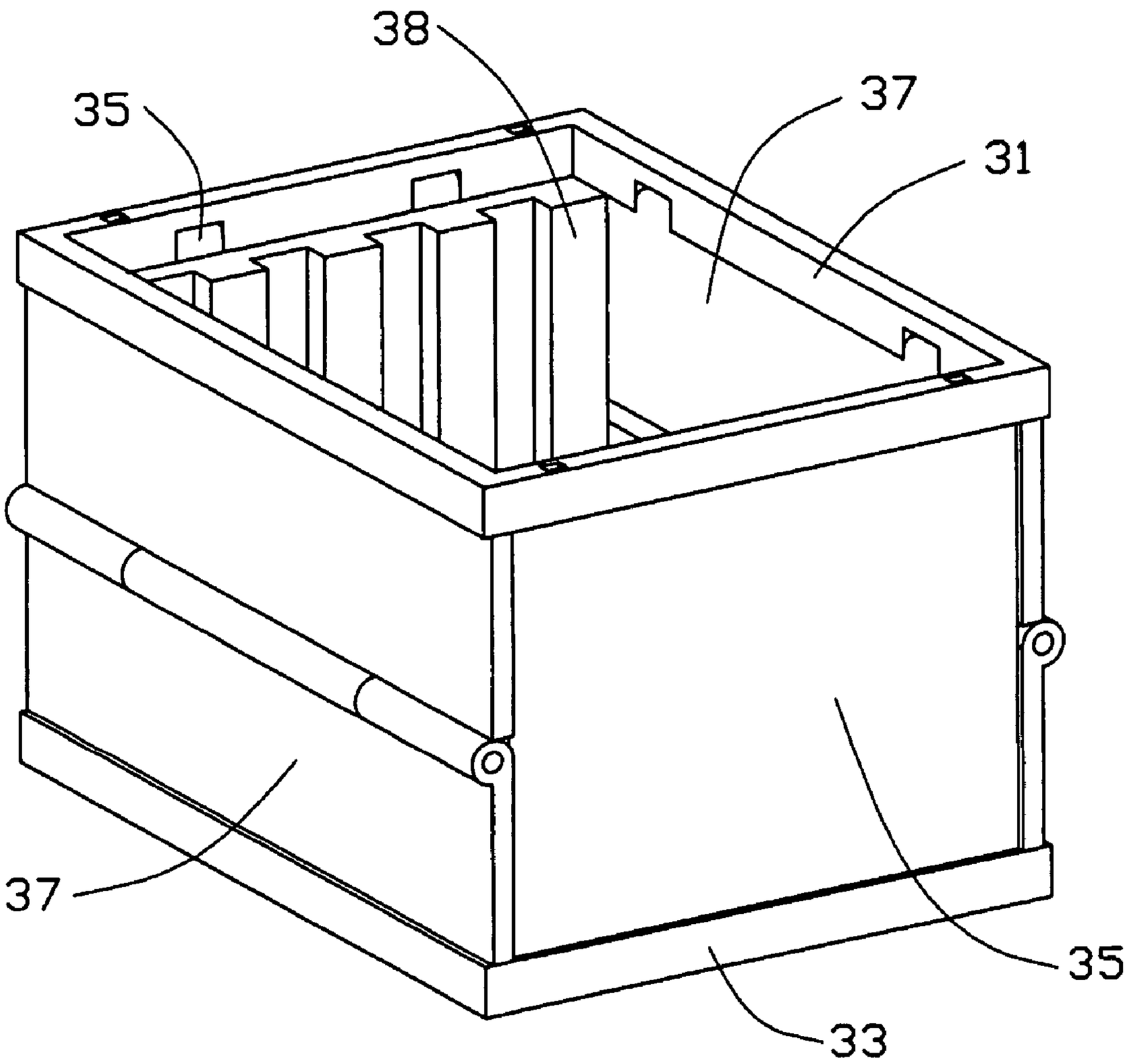


FIG. 1

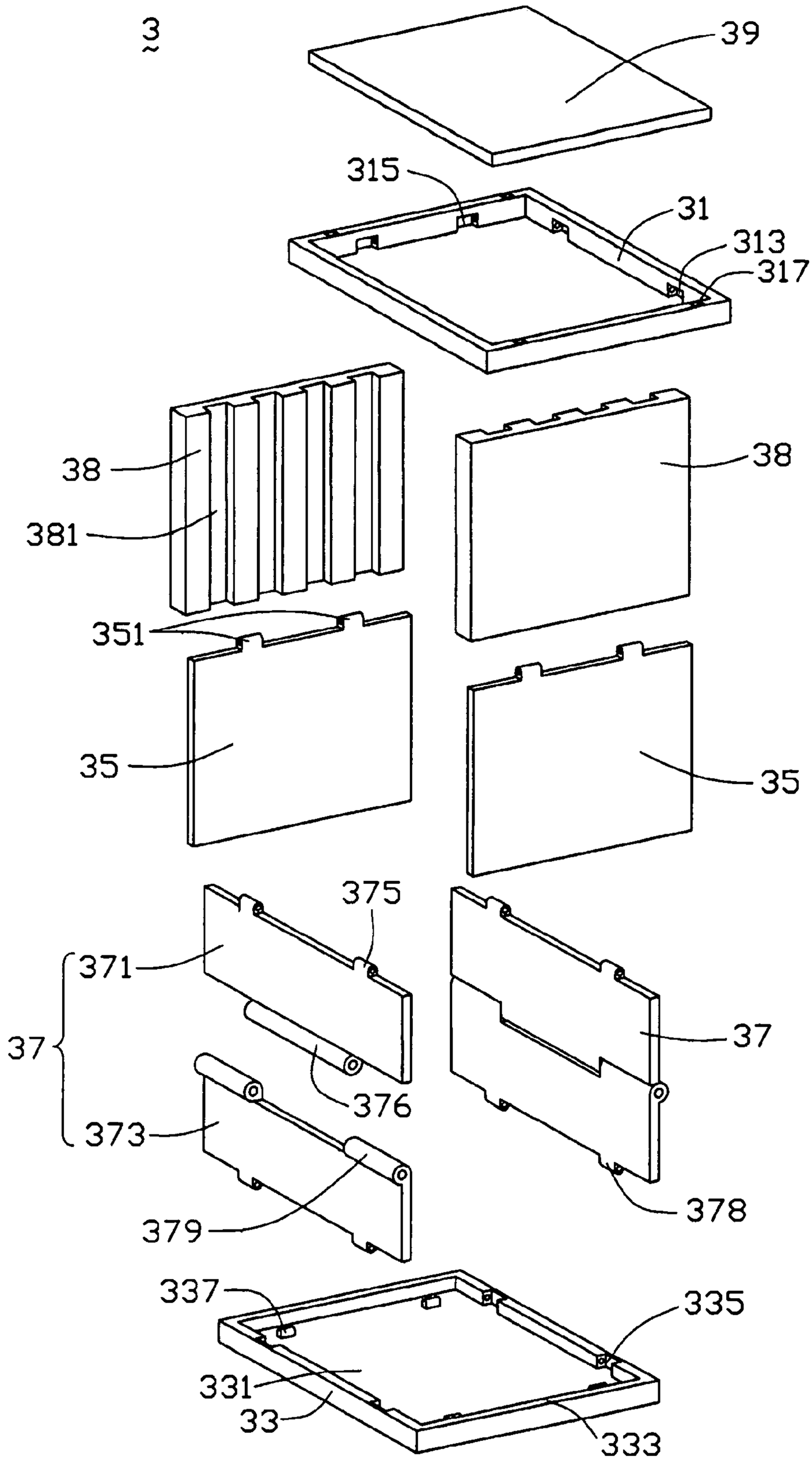

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FIG. 2

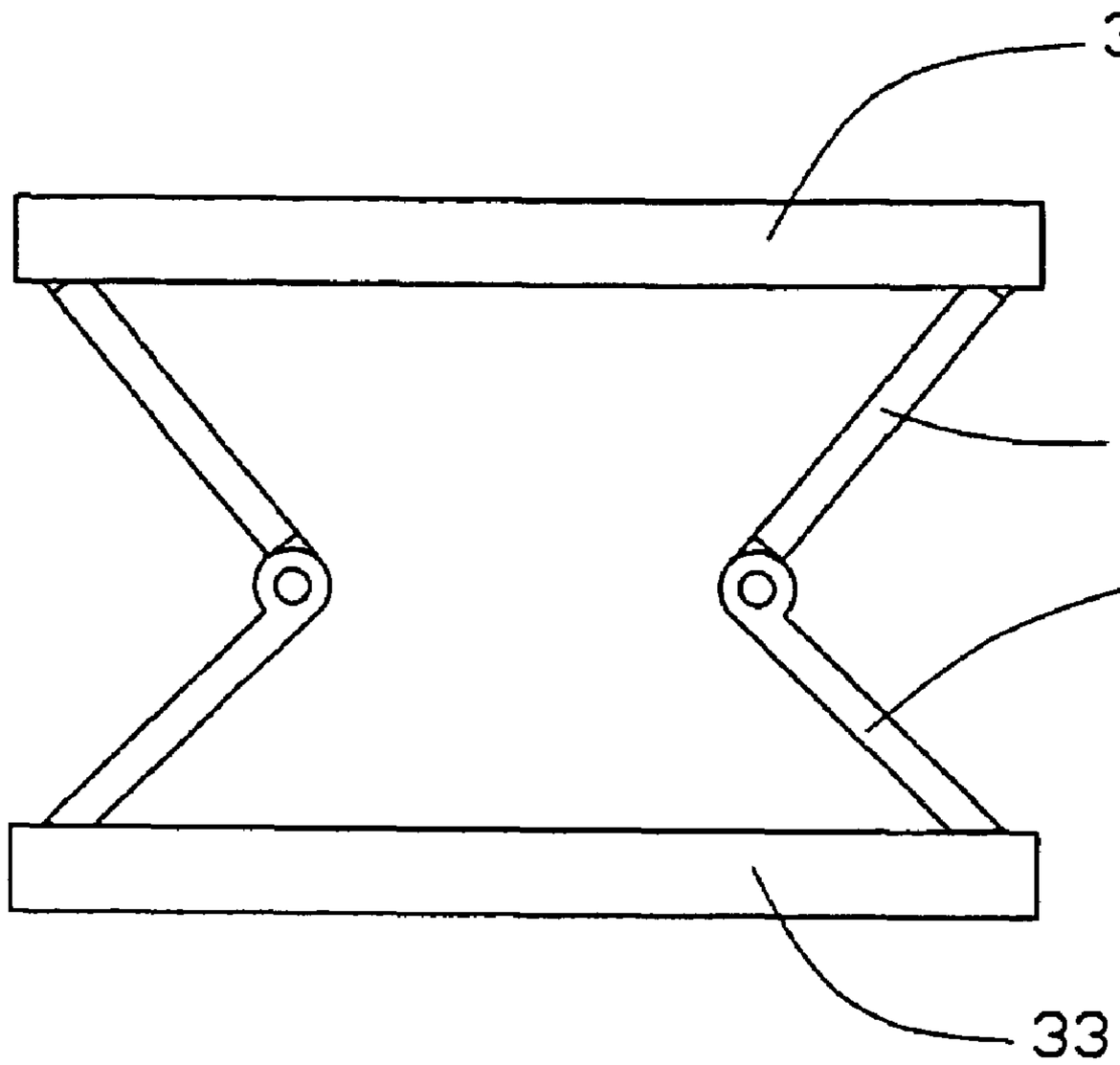

FIG. 3

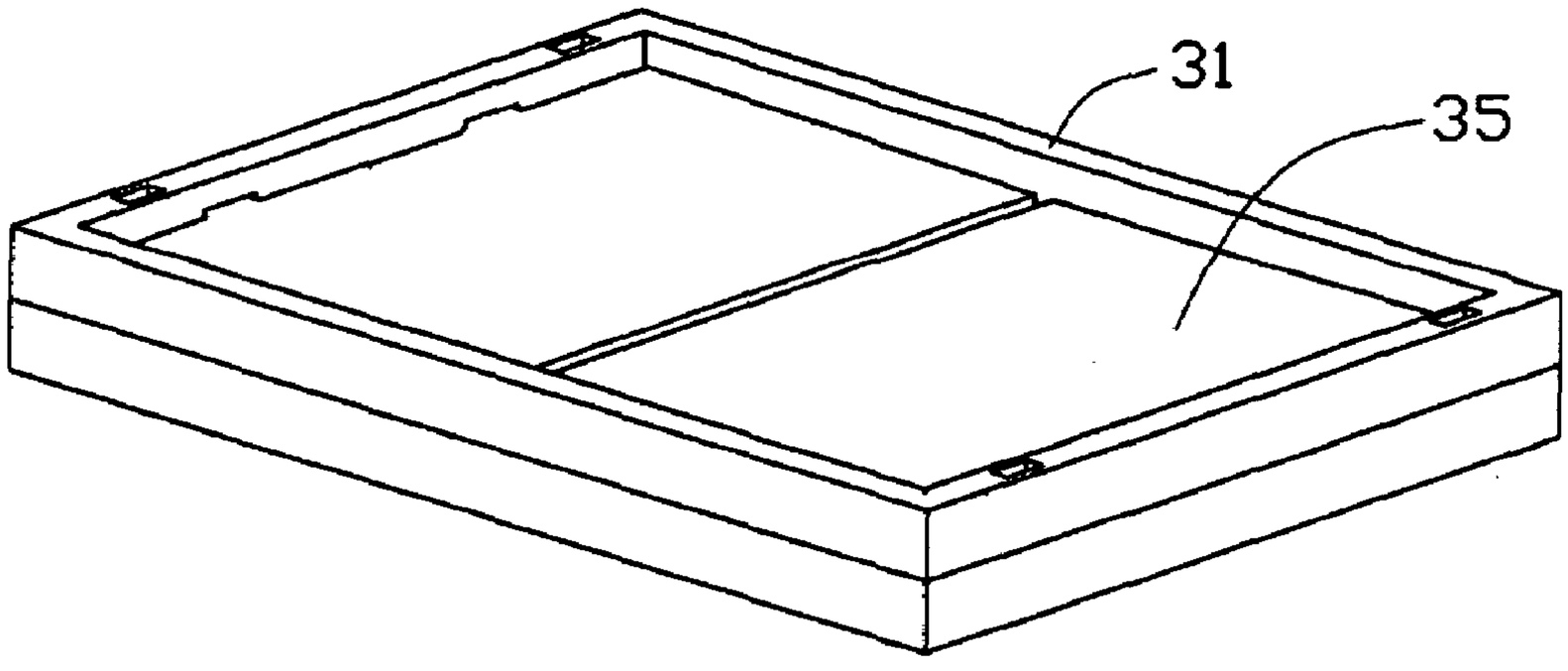

FIG. 4

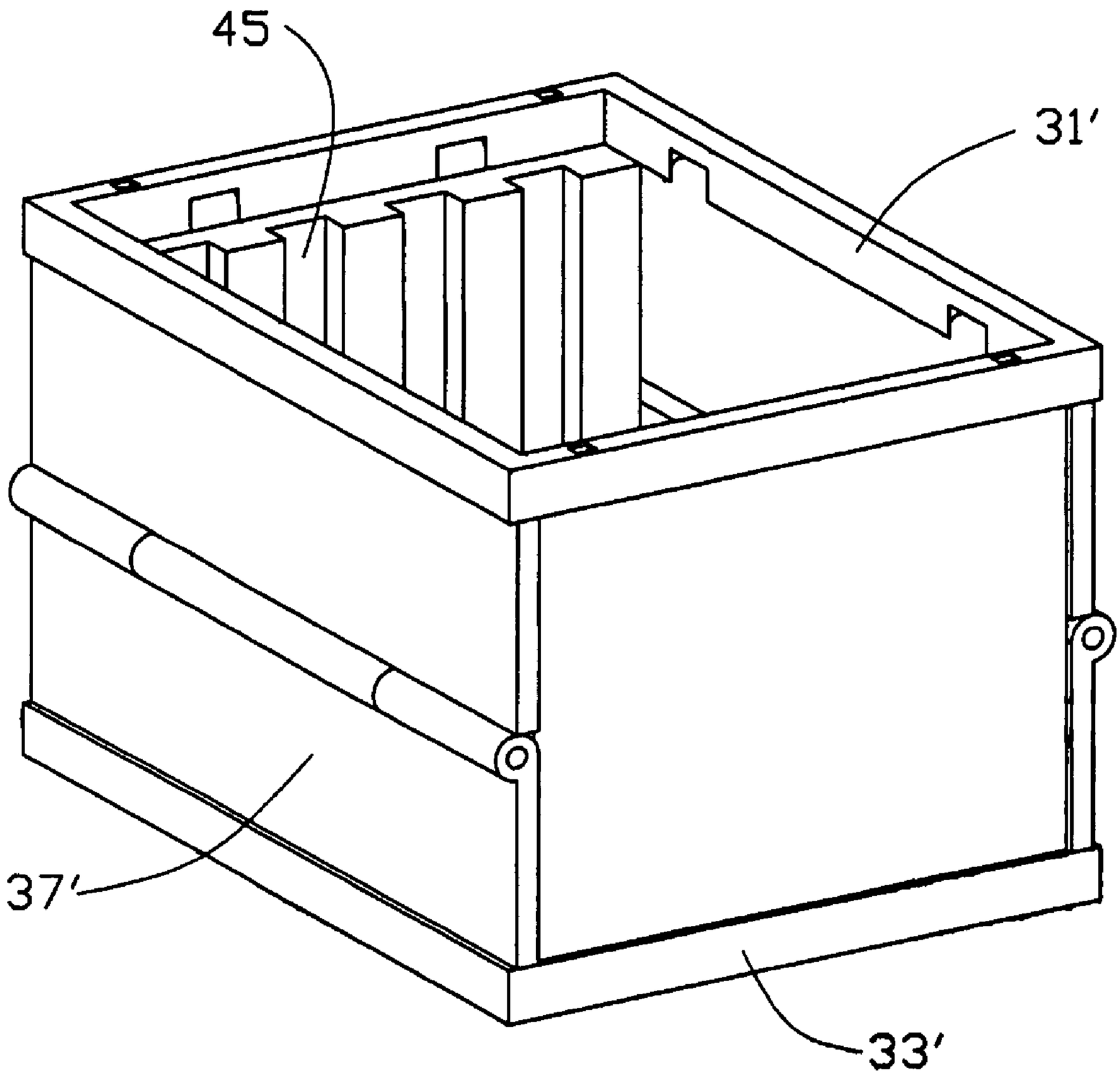

FIG. 5

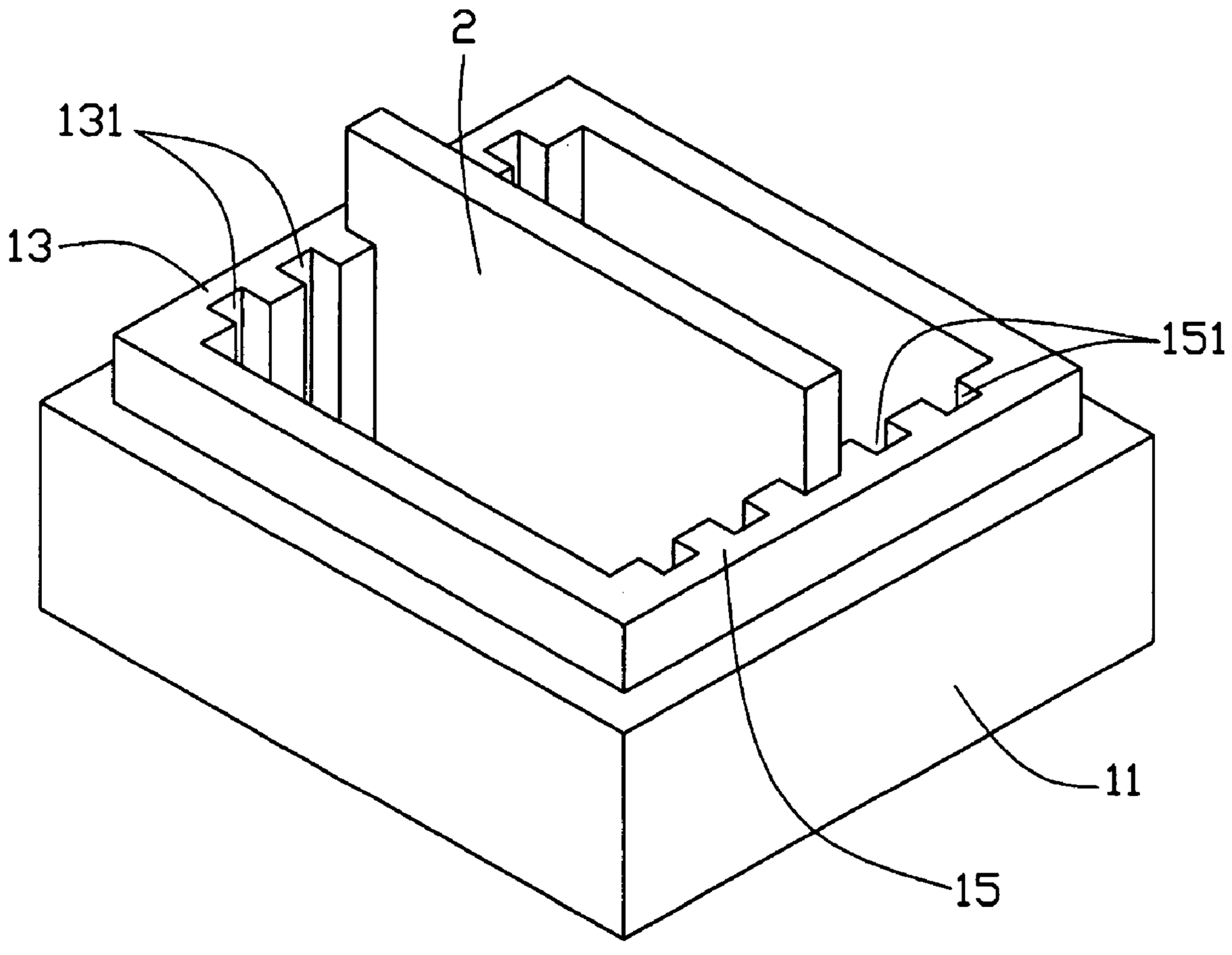

FIG. 6
(PRIOR ART)

FOLDING CONTAINER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a container, and especially to a folding container used for transporting or shipping Liquid Crystal Display (LCD) panels.

2. Description of Prior Art

The process of fabricating an LCD generally comprises forming an LCD panel (known as a "cell process"), and assembling the LCD panel with other parts such as a driving integrated circuit (IC), a printed circuit board (PCB), a backlight system, etc. (known as a "modular process"). The cell process and the modular process are usually performed at different factories in different districts of a country or even in different countries. This is because the modular process is generally labor-intensive. Therefore, after the cell process, the LCD panels are generally shipped or transported to another district or country where labor costs are most favorable.

A conventional container used to transport LCD panels is shown in FIG. **6**. The container comprises a main body **11** having a parallelepiped configuration, and a cover (not shown). The main body **11** comprises a pair of opposite side plates **13**, **15**. Each side plate **13**, **15** defines a plurality of vertical slots **131**, **151**. Each pair of corresponding opposite slots **131**, **151** receives and holds an LCD panel **2**. After all the LCD panels **2** are received in the main body **11**, the cover is attached on the main body **11**, thereby forming a protective receptacle for the LCD panels **2**.

The container is made of expanded polypropylene (EPP), so that it has good shock-proof characteristics. In addition, a plurality of the containers is secured in a larger, strong receptacle (not shown), to protect the containers from being accidentally hit or squeezed during transportation. The larger receptacle is also parallelepiped-shaped, so that it can easily receive the containers and provide sufficient protection therefor.

However, once the LCD panels **2** are unloaded from the containers, the empty containers must be returned to the cell process factory from which they came. The empty containers take up a lot of space, which results in high freight costs.

An improved container that overcomes the above-mentioned disadvantages is desired.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a folding container which can be folded to a compact size when not in use.

In order to achieve the object set forth above, a folding container in accordance with the present invention comprises: a rectangular upper frame including a pair of first opposite sides each having an inside part that is provided with a plurality of first engaging portions, and a pair of second opposite sides each having an inside part that is provided with a plurality of second engaging portions; a pair of side plates each including a plurality of third engaging portions, each of the side plates being pivotally connected to the first engaging portions of a respective first side of the upper frame via the third engaging portions, whereby the side plates are movable relative to the upper frame; a pair of folding plates positioned between the side plates, each of the folding plates including an upper plate and a lower plate pivotally connected to the upper plate, the upper plate being pivotally connected to the second engaging portions of a respective second side of the upper frame; a bottom plate including a pair of second opposite sides corresponding to the second sides of the upper frame, each of the second sides of the bottom plate having a plurality of fourth engaging portions, each of the lower plates being pivotally connected to respective fourth engaging portions of the bottom plate, the side plates, folding plates and bottom plate cooperatively forming a receptacle; and a pair of slot plates with a plurality of slots, each of the slot plates being adjacent to a respective one of the side plates.

The folding container of the present invention can be easily folded and loaded into a vehicle so that it occupies a substantially reduced space. This can commensurately reduce freight costs when returning the empty folding container to its source.

Other objects, advantages, and novel features of the present invention will become more apparent from the following detailed description of preferred embodiments when taken in conjunction with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric view of a first embodiment of a folding container according to the present invention, but not showing a cover thereof;

FIG. **2** is an exploded, isometric view of the first embodiment of the folding container according to the present invention;

FIG. **3** is an end elevation of the folding container of FIG. **1**, but showing the folding container in the process of being folded;

FIG. **4** is an isometric view of the folding container of FIG. **1** in a folded state;

FIG. **5** is an isometric view of a second embodiment of a folding container according to the present invention, but not showing a cover thereof; and

FIG. **6** is an isometric view of a conventional container holding an LCD panel therein, but not showing a cover of the container.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Reference will now be made to the drawings to describe the present invention in detail.

Referring to FIG. **1** and FIG. **2**, a folding container **3** in accordance with a first embodiment of the present invention comprises an upper frame **31**, a bottom plate **33**, a pair of opposite side plates **35**, a pair of folding plates **37** positioned between the pair of side plates **35**, and a pair of slot plates **38**. The side plates **35**, folding plates **37**, and bottom plate **33** cooperatively form a receptacle having an opening. Each slot plate **38** is adjacent to a respective side plate **35**. The folding container **3** further comprises a cover **39** to cover the opening of the receptacle.

The slot plates **38** are made of EPP. The upper frame **31**, side plates **35**, folding plates **37** and bottom plate **33** are made of electrostatic discharge protected plastic. Moreover, one of the folding plates **37** can be made of transparent plastic, so that a user can observe the inside of the folding container **3**.

The upper frame **31** is rectangular with a hollow middle. Two folding plate engaging portions **313** are formed in inside parts of each of two opposite long sidewalls (not labeled) of the upper frame **31**. The folding plate engaging portions **313** are configured as hinge-like sockets. Two side

plate engaging portions **315** are formed in inside parts of each of two opposite short sidewalls (not labeled) of the upper frame **31**. The side plate engaging portions **315** are configured as hinge-like sockets. Two holes **317** are defined in an upper surface (not labeled) of each of the short sidewalls of the upper frame **31**.

The bottom plate **33** comprises a base **331**, and a rectangular frame **333** extending from four sides of the base **331**. Two folding plate engaging portions **335** are defined at each of two opposite long sidewalls (not labeled) of the rectangular frame **333**. The folding plate engaging portions **335** are configured as hinge-like sockets. The base **331** comprises two engaging protrusions **337** adjacent to the each of two opposite short sidewalls of the rectangular frame **333**. Opposite surfaces of the engaging protrusions **337** are sloped.

Each side plate **35** is rectangular, and comprises a top edge and a bottom edge. The top edge has two engaging portions **351**. The engaging portions **351** are configured to be hinge-like. The bottom edge defines two engaging grooves (not shown), matching with corresponding engaging protrusions **337** of the base **331**.

Each folding plate **37** comprises an upper plate **371** and a lower plate **373**. The upper plate **371** comprises a bottom engaging portion **376**, and the lower plate **373** comprises two spaced top engaging portions **379**. The bottom engaging portion **376** and the top engaging portions **379** are each configured to be hinge-like. The upper plate **371** is pivotally connected to the lower plate **373** by way of a pin (not shown) being received through the bottom and top engaging portions **376**, **379**. A top edge of the upper plate **371** comprises two engaging portions **375**, corresponding to respective engaging portions **313** of the upper frame **31**. The engaging portions **375** are configured to be hinge-like. A bottom edge of the lower plate **373** comprises two engaging portions **378**, corresponding to respective folding plate engaging portions **335** of the rectangular frame **333**. The engaging portions **378** are configured to be hinge-like.

The slot plates **38** are rectangular, and each defines a plurality of parallel slots **381**. A length and a width of each slot plate **38** is respectively equal to those of either side plate **35**. However, a thickness of each slot plate **38** can vary according to need.

A bottom face of the cover **39** has four pins (not shown), corresponding to the holes **317** of the upper frame **31**.

In assembly, the side plates **35** and the folding plates **37** are positioned between the upper frame **31** and the bottom plate **33**. Each slot plate **38** is adjacent to an inside of a respective side plate **35**. Each side plate **35** is pivotally connected to the corresponding side plate engaging portions **315** of the upper frame **31** via the engaging portions **351**, so as to be movable relative to the upper frame **31**. The engaging grooves of the bottom edges of the side plates **35** can engagingly receive the engaging protrusions **337** of the base **331** when the side plates **35** are erect. Each upper plate **371** is pivotally connected to the corresponding folding plate engaging portions **313** of the upper frame **31**, and each lower plate **373** is pivotally connected to the corresponding folding plate engaging portions **335** of the bottom plate **33**. If desired, each slot plate **38** can be fixed to its corresponding side plate **38** by fastening means such as screws, adhesive, or the like. Alternatively, each slot plate **38** may instead be adjacent to a respective folding plate **37**. In such case, a size of the slot plate **38** is configured to correspond to a size of the folding plate **37**. If desired, each slot plate **38** can be fixed to its corresponding folding plate **37** by fastening means such as screws, adhesive, or the like.

After assembly of the folding container **3**, an LCD panel (not shown) can be inserted into each pair of corresponding slots **381**. The cover **39** is then mate with the upper frame **31**. Thus, the receptacle with the LCD panels therein is sealed. Moreover, the pins of the cover **39** are engagingly received in the holes **317** of the upper frame **31** so that the cover **39** is firmly mated with the upper frame **31**.

Referring to FIGS. **3** and **4**, to fold the empty container **3**, the LCD panels are firstly unloaded therefrom. Then the following steps are performed: firstly, the slot plates **38** are taken out from the receptacle; secondly, the side plates **35** are rotated from the erect positions up to horizontal positions; and thirdly, the folding plates **37** are pushed respectively inwardly, so that corresponding upper and lower plates **371**, **373** overlap each other.

FIG. **4** shows the folding container **3** in a folded state. The pair of side plates **35**, the pair of folding plates **37** and the bottom plate **33** are overlapped one on the other in sequence, such that overall the folding container **3** is thin. Thus, the space occupied by the folding container **3** is dramatically reduced. This can significantly reduce freight costs when empty folding containers **3** are returned to their source after use. Also, because the slot plates **38** are substantially flat, they can be conveniently stacked one on the other separate from the folding container **3**. Alternatively, the slot plates **38** can be placed on the cover **39** within the baseframe **333** of the folding container **3**.

FIG. **5** shows a folding container in accordance with a second embodiment of the present invention, except for a cover thereof. The folding container is similar to the folding container **3** of the first embodiment, and comprises an upper frame **31'**, a pair of folding plates **37'**, and a bottom plate **33'**. The folding container also comprises a pair of side plates **45** each defining a plurality of slots (not labeled). The side plates **45** are made of EPP.

Assembly of the folding container of the second embodiment is similar to that of the folding container **3**. The folding container has similar benefits to those of the folding container **3**. Moreover, because each side plate **45** is an integrated body incorporating the slots, when the folding container of the second embodiment is folded, there are no separate slot plates. That is, there is no possibility of slot plates being misplaced.

In the embodiments described above, the connection of the side plates **35** with the upper frame **31**, the upper plates **371** with the lower plates **373**, and the folding plates **37** with the upper frame **31** and the bottom plate **33** is obtained by way of the above-described engaging portions. In the above-described embodiments, the engaging portions are all hinge-like. However, in further alternative embodiments, other kinds of engaging portions such as pivot members can be employed instead.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. A folding container, comprising:

a rectangular upper frame including a pair of first opposite sides each having an inside part that is provided with a plurality of first engaging portions, and a pair of second

opposite sides each having an inside part that is provided with a plurality of second engaging portions;

a pair of side plates each including a plurality of third engaging portions, each of the side plates being pivotally connected to the first engaging portions of a respective first side of the upper frame via the third engaging portions, whereby the side plates are movable relative to the upper frame;

a pair of folding plates positioned between the side plates, each of the folding plates including an upper plate and a lower plate pivotally connected to the upper plate, the upper plate being pivotally connected to the second engaging portions of a respective second side of the upper frame;

a bottom plate including a pair of second opposite sides corresponding to the second sides of the upper frame, each of the second sides of the bottom plate having a plurality of fourth engaging portions, each of the lower plates being pivotally connected to respective fourth engaging portions of the bottom plate, the side plates, folding plates and bottom plate cooperatively forming a receptacle; and

a pair of slot plates with a plurality of slats, each of the slot plates being adjacent to a respective one of the side plates.

2. The folding container as recited in claim **1**, further comprising a cover used to mate with the upper frame.

3. The folding container as recited in claim **1**, wherein each of the slot plates is integrated with said respective one of the side plates.

4. The folding container as recited in claim **1**, wherein each of the slot plates is fixed to said respective one of the side plates by fasteners or adhesive.

5. The folding container as recited in claim **1**, wherein the slot plates are made of expanded polypropylene.

6. The folding container as recited in claim **1**, wherein any one or more of the upper frame, side plates, folding plates and bottom plate is made of electro-static discharge protected plastic.

7. The folding container as recited in claim **1**, wherein each of the slot plates is adjacent to a respective one of the folding plates.

8. The folding container as recited in claim **1**, wherein the bottom plate further comprises a base and a rectangular frame extending from sides of the base, and the fourth engaging portions of the bottom plate are located at a pair of opposite second sides of the rectangular frame.

9. The folding container as recited in claim **8**, wherein the base further comprises a plurality of engaging protrusions adjacent to a pair of opposite first sides of the rectangular frame, and each of the side plates further comprises a plurality of engaging grooves engagingly receiving the engaging protrusions.

10. The folding container as recited in claim **1**, wherein the bottom plate further comprises a plurality of engaging protrusions adjacent to a pair of opposite first sides, and each of the side plates further comprises a plurality of engaging grooves engagingly receiving the engaging protrusions.

11. The folding container as recited in claim **1**, wherein the first, second, third and fourth engaging portions are hinge-like.

12. The folding container as recited in claim **1**, wherein at least one of the folding plates is made of transparent plastic.

13. A folding container, comprising:

a pair of first and second rectangular frame;

a pair of opposite first side walls located between said first frame and second frame, and each pivotally linked to only one of the first and second frames;

a pair of opposite second side walls located between said first and second frames and alternately arranged with said pair of first side walls in alignment with said first and second frames in a vertical direction;

each of said second side walls including upper and lower parts pivotally to each other, and the upper pan and the lower part respectively pivotally linked to the first and second frames, respectively; and

a plurality of vertical slots unitarily formed in an interior face of each of the first side walls for respectively holding LCD (Liquid Crystal Display) panels, and interengagement means formed on a bottom edge portion of each of the first side walls for retaining the corresponding first side walls in a vertical position.

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